



# AVIS

The **A**irborne **V**isible and **I**nfrared  
Imaging **S**pectrometer



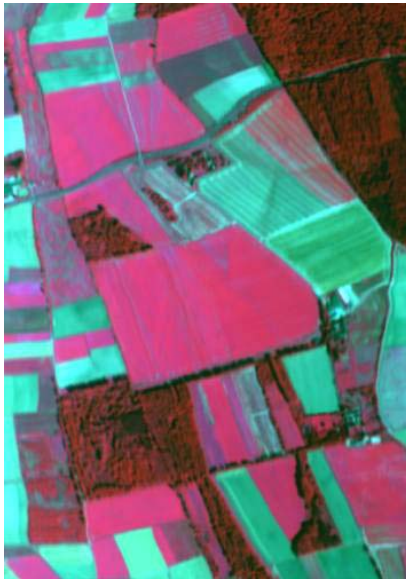
**AVIS** was developed at the  
Chair for Geographical Remote  
Sensing, Dept. of Earth and  
Environmental Sciences of the  
University of Munich.



Imaging spectrometer provide hyperspectral data. They are more capable than conventional airborne sensors and satellite sensors. Hyperspectral data used to be difficult and expensive to access. With the sensor **AVIS** high quality can be offered at a favourable price.

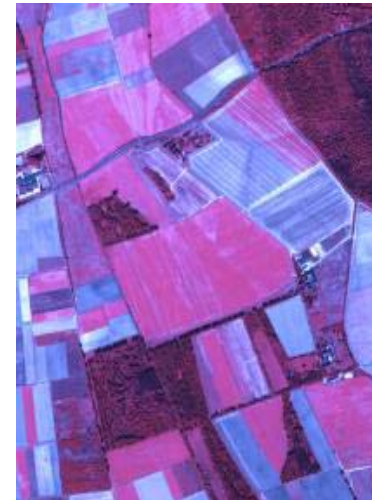
### True-colour illustration

- Forest appears in dark-green tones.
- Vegetation appears in different green tones.
- Soil appears in different brown tones.



### False-colour illustration

- Green vegetation appears in different red tones.
- Soil appears in green colours.
- The intensity of red colour is an indicator for the vitality of vegetation.
- Structures of the fields are clearly recognizable.



Comparison to a conventional  
aerial CIR photograph 2001

Hyperspectral sensors, supported by sophisticated evaluation methods, can supply information for a series of applications:

- Observation of the dynamics of plant growth and vegetation vitality in agricultural stocks
- Determination of agricultural yield using multitemporal analysis
- Calculation of chlorophyll and nitrogen contents of plant canopies
- Detection of small spatial variations within the fields
- Examination of heterogenities within ecosystems
- Monitoring of the ecological status lakes (e.g. classification of macrophytes )
- Detection of damages by hail and storm in agricultural stocks
- Detection of plant damages and plant diseases
- Land use classification

### Technical details of the sensor:

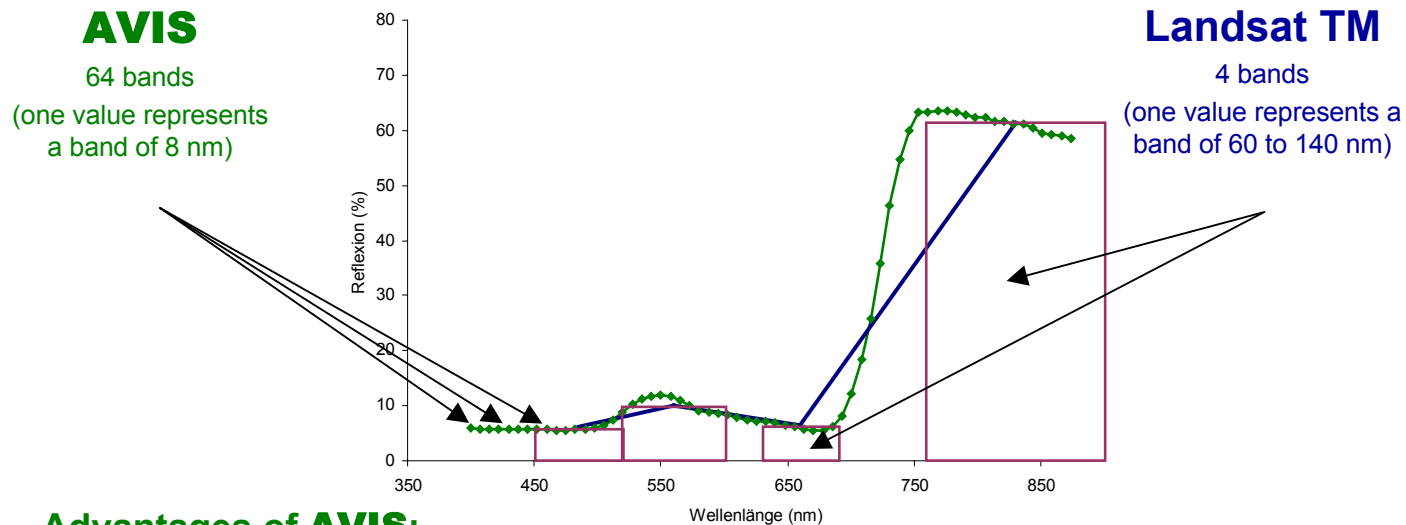
- Number of spectral bands: 64 nominal, 128 max.
- Spectral coverage: 400 – 875 nm
- Spectral resolution: 8 nm
- Spatial resolution: 2 – 10 m
- Precise geographical location of the images (integrated GPS and INS)

## Comparison of hyperspectral sensors (e.g. **AVIS**) with multispectral sensors (e.g. Landsat TM)

The sunlight reflected by the land surface enables conclusions on many characteristics of the canopy. This reflectance is measured by optical sensors. The significance of the information rises with the quality of the sensor.

Hyperspectral sensors provide more precise information of the spectral characteristics than multispectral sensors. The basic idea of imaging spectrometry is to determine the surface parameters quantitatively by analysis spectral features without physical contact.

This technology and sophisticated evaluation methods provides much better decision basis. This can be used for better land and water management as well as enviromental monitoring or disaster management.



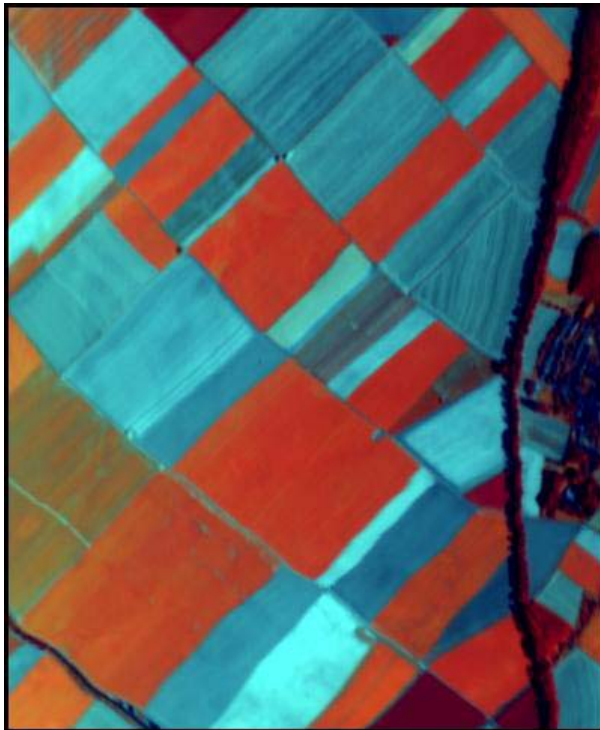
### Advantages of **AVIS**:

Complete coverage of the wavelength region between 400 and 875 nm, with 64 spectral bands and a spectral resolution of 8 nm.

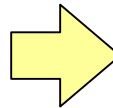
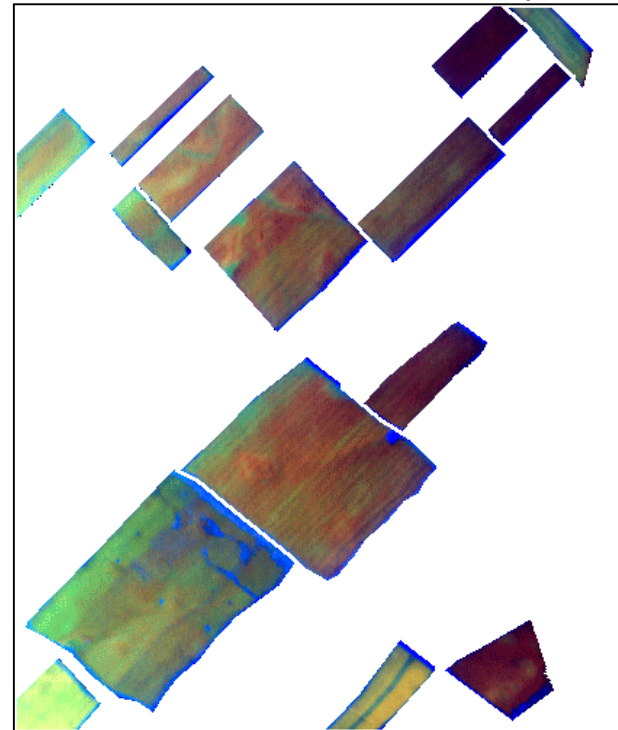
**AVIS** data have a very high spectral sensitivity by use of 14-bit technology. Each individual channel can acquire more than 16.000 intensity differences (grey values) (Landsat TM: 8-bit technology corresponds to 256 intensity differences).

Due to this high radiometric resolution, which exceeds the ability of conventional satellite sensors and human eye as well, small differences within at first sight homogeneous surfaces are recognizable.

This illustration  
corresponds to a 8-bit resolution



Analysis of sugar beet fields with  
**AVIS** after use of 14-bit data depth





Informations can be derived from digital image after processing hyperspectral **AVIS** data also with changing illumination conditions e.g. in cloud shadows. This leads to substantial advantages: Because the possibility to capture data even under cloudy conditions the number of potential acquisitions increases and the coordination and execution of flight campaigns is easier.

CIR illustration



cloud  
shadow

Infrared only

Hyperspectral index  
(black/white-illustration)

Even in a  
cloud shadow  
details are  
recognizable.

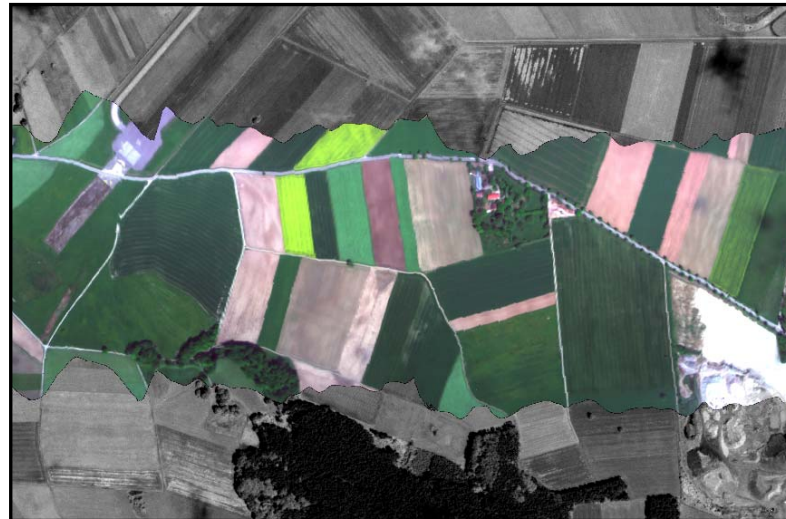
Original **AVIS** recording



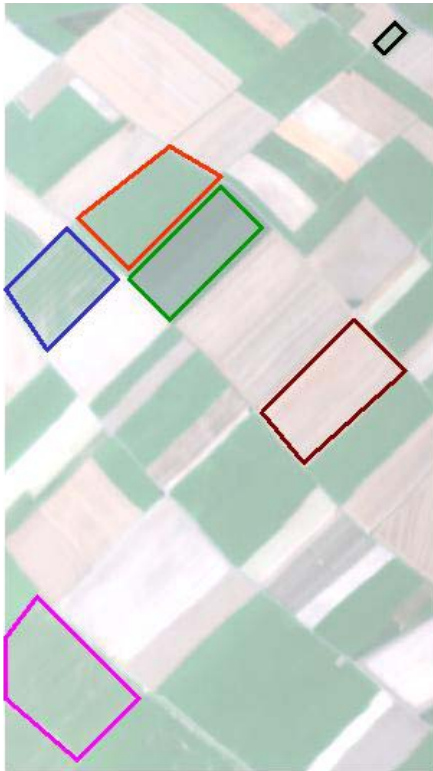
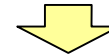
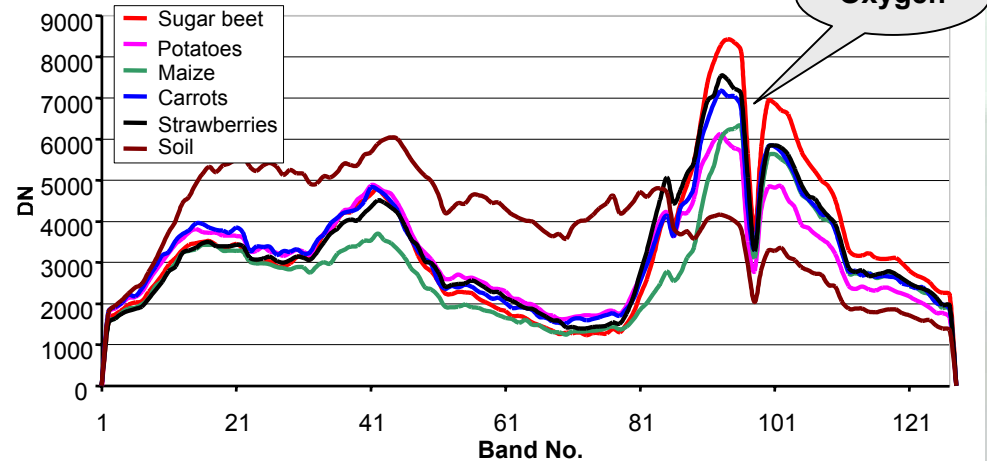
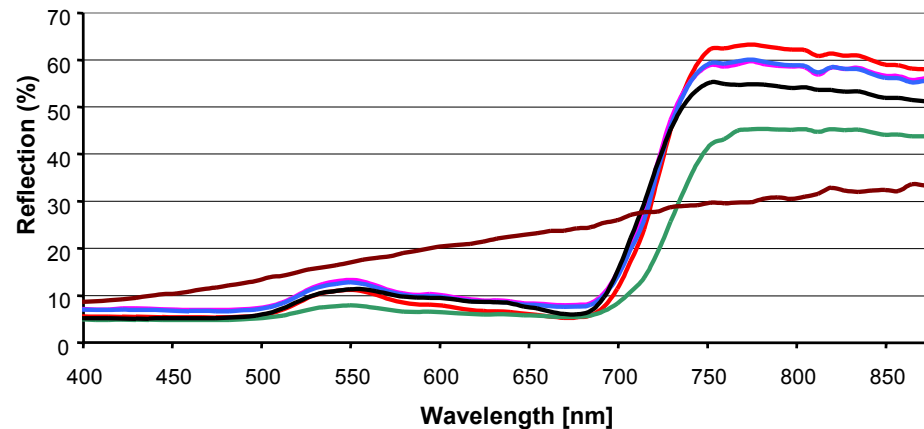
Geometric corrected (**AVIS** data is georeferenced automatically using GPS and INS recordings).



Geometric corrected **AVIS** data overlaid to a black/white IKONOS scene (1m spatial resolution).



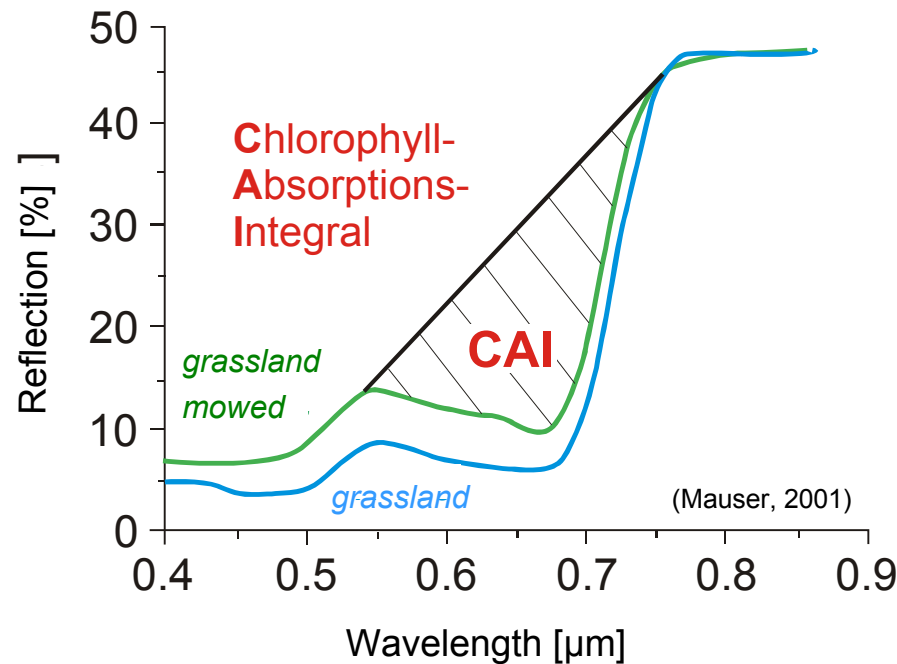
For the determination of information of the land surface, influences of the atmosphere (e.g. oxygen and water vapour in air) must be corrected by an atmospheric correction.

**AVIS raw data****AVIS data atmospheric corrected**



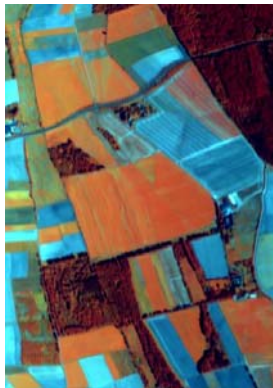
### “From image to information”

From remote sensing data indices can be derived, which allow to draw conclusions on important plant parameters. CAI (Chlorophyll-Absorptions-Integral) for example is a hyperspectral index for the quantitative determination of plant parameters.

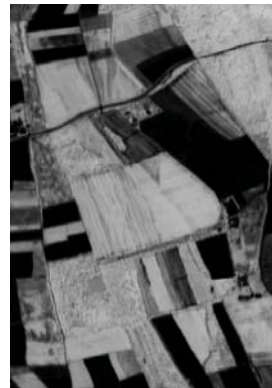


The CAI can be determined only with imaging spectrometers and is more sensitive than usual indices.

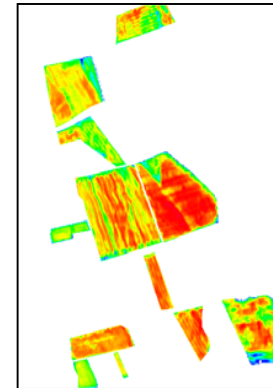
The CAI correlates with the chlorophyll and nitrogen content of plant canopy.



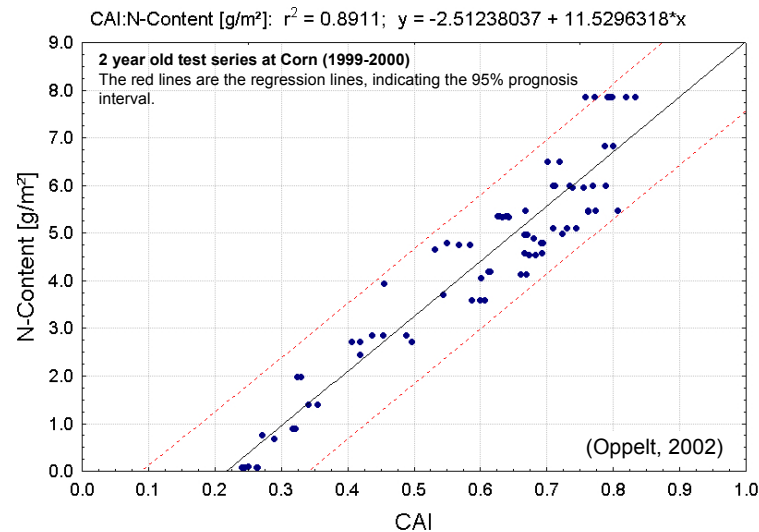
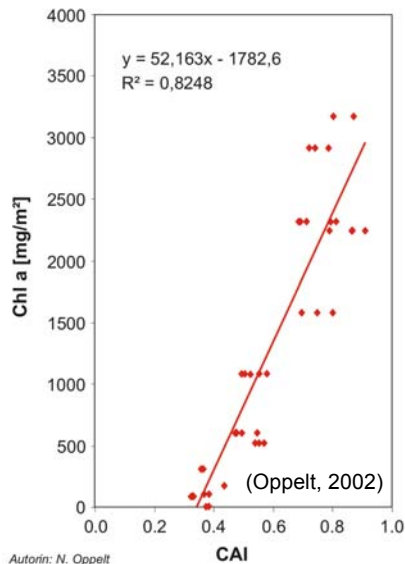
Original **AVIS** image

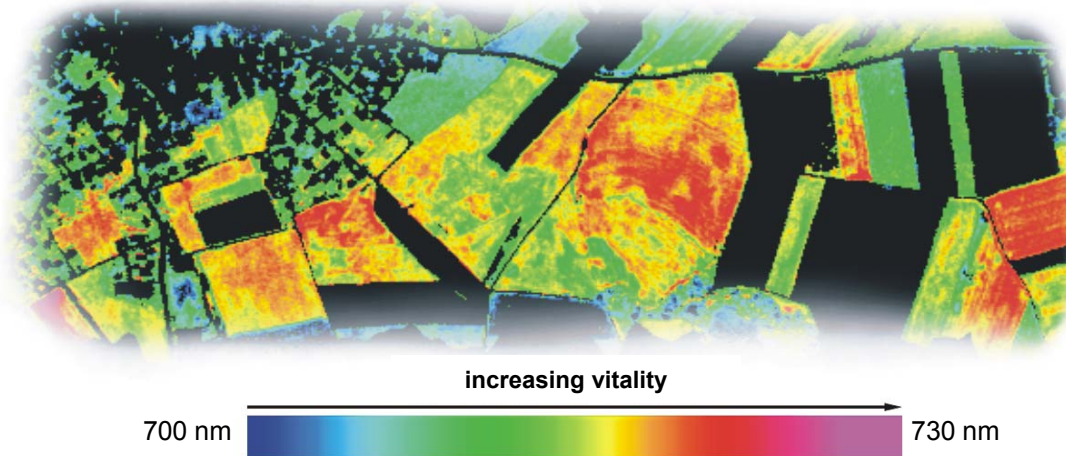


**CAI**  
(black/white-illustration)



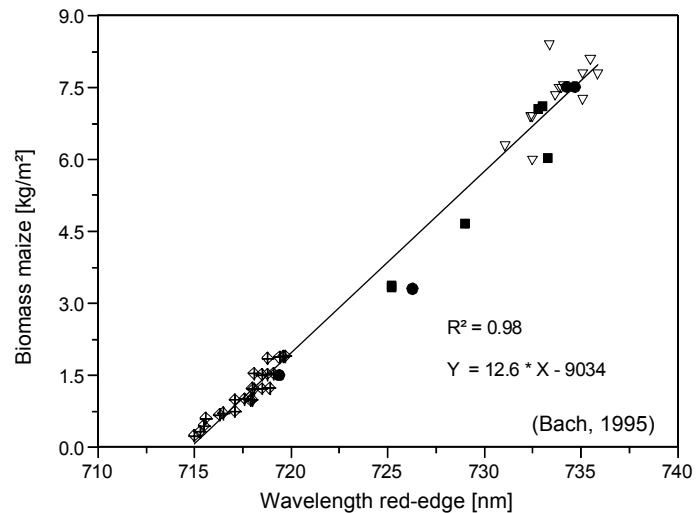
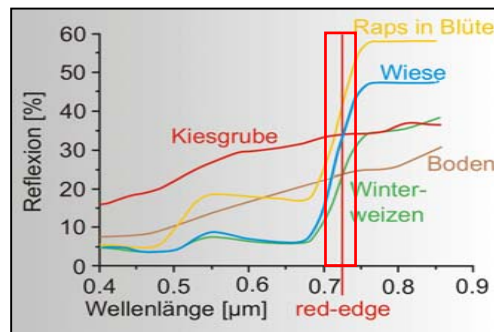
**CAI**  
(coloured illustration)





## Red-Edge

- is a measure for the vitality of vegetation (plant growth, biomass).
- is determined by the maximum point of the rise of reflectance by vegetation in the near infrared.



## We offer

- Organisation and execution of flights campaigns
- Geocoded and atmospheric corrected data with up to 128 spectral bands
- Derivation of land surface parameters
- Data distribution in all common formats
- Execution of pilot studies to develop new procedures for individual applications

## Contact

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